

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

Regarding the Wireless Broadband Alliance
Comments filing of October 2, 2017

Comments on the Notice of Inquiry
Regarding Expanding Flexible Use in Mid-Band Spectrum
Between 3.7 and 24 GHz

GN Docket No 17-183

ERRATUM

We are correcting our Comments filing of October 2, 2017 to note the specific member companies that participated in its preparation. Those companies are; Accuris Networks, Alphabet Access, Broadcom, Cisco, Hewlett Packard Enterprise, Intel Corporation and Ruckus. These comments do not necessarily represent the view of any member of the Wireless Broadband Alliance not previously named or the view of any of the Alliance's Board of Directors not affiliated with those previously named entities

A corrected version is attached here.

Tiago Rodrigues
Senior Director

3 Tai Seng Drive
#04-01 Singapore
535216

PHONE:- +351 961946680

October 10, 2017

Executive Summary

The participating companies of the Wireless Broadband Alliance (WBA) support the Commission's examination of mid-band spectrum, and urge the Commission to promptly advance to a Notice of Proposed Rulemaking. These comments focus on the immediate need for unlicensed spectrum at 6 GHz. The companies support an NPRM that proposes to introduce unlicensed technologies into the 5925-6425 MHz and 6425-7125 MHz bands, and we urge that the Commission merge its consideration of these two bands at the NPRM stage.

The need for additional unlicensed spectrum is evident, as additional spectrum at 5 GHz has not been forthcoming at a time when demand is exploding, a fact reported in various studies. Looking ahead to continued demand challenges, 96% of respondents to an internal WBA survey agreed that obtaining additional mid-band spectrum for unlicensed operations is "vital" to our membership, provided that incumbent operations are protected.

Moreover, the need for additional unlicensed spectrum is occurring at a time when industry is already making good use of the 5 GHz spectrum for which Dynamic Frequency Selection (DFS) is required. According to a survey of the WBA membership, 100% of outdoor and indoor Public Access Wi-Fi and Enterprise Managed Services Wi-Fi have enabled DFS channels on their networks, while 92% of Small/Medium Business Managed Service Wi-Fi and Residential Wi-Fi have done so.

At 6 GHz, unlicensed is the most effective way to unlock the additional value of the band, as it can operate under technical conditions that do not limit incumbents from exercising their rights to licensed spectrum. Given the need to protect incumbents, access to the entire 5.925-7.125 GHz band is needed to support multiple wide channel operations, to reduce power

spectral density of unlicensed use, and to ensure commercially reasonable spectrum availability for unlicensed technologies. Alternatives to unlicensed are less attractive.

The companies also suggest the Commission consider articulating policy principles to frame the technical debate, such as finding that the purpose of the proposed rules is to obtain higher utilization of the band and address exploding demand for unlicensed spectrum.

The companies note that the ULS reveals that the number of licenses in the band vary significantly by sub-band. Not only does this suggest that there is good reason to proceed to an examination of how to make use of under-utilized spectrum, but it also lends itself to identifying four distinct U-NII designations for the band, which are suggested herein.

Furthermore, given the diversity of incumbents, the companies believe that there is not a “one size fits all” set of mitigations that can apply. The Commission should be open to different requirements on indoor versus outdoor unlicensed operations, and should draw from its 2014 U-NII-1 decision as well. We suggest that the NPRM include questions about the use of elevation masks for outdoor unlicensed transmissions, differentiated power levels (including tradeoffs between power levels and more extensive mitigation technology, and whether the 6 GHz band could support power levels utilized in 5 GHz). We also note that database-orchestrated mitigations would represent a sharp departure from 5 GHz business models, but recommends that the NPRM include questions about databases in the event simpler solutions examined in the docket do not protect incumbents from harmful interference.

TABLE OF CONTENTS

I.	INTRODUCTION	5
II.	THE PRESSING NEED FOR ADDITIONAL MID-BAND UNLICENSED SPECTRUM	8
III.	COMMENTS ON DYNAMIC FREQUENCY SELECTION (DFS) IN THE 5 GHZ BANDS	10
IV.	COMMENTS ON 5.925 TO 7.125 GHZ	12
V.	COMMENTS ON 3.7 TO 4.2 GHZ	23
VI.	COMMENTS ON OTHER BANDS BETWEEN 3.7 AND 24 GHZ	23
VII.	CONCLUSION	24

I. INTRODUCTION

Founded in 2003, the Wireless Broadband Alliance (WBA) champions the development of a converged wireless broadband ecosystem; through the adoption of seamless, secure and interoperable unlicensed wireless broadband services, and the delivery of outstanding user experiences for the subscribers of our member operators. In order to make this a reality, the WBA is actively pursuing various initiatives to drive the evolution of Next Generation Wi-Fi, Connected Cities, advanced Unlicensed and Licensed wireless technologies, Policy Advocacy, and Wireless Innovation. Our global membership of 120 companies includes major fixed operators; seven of the top 10 mobile operator groups (by revenue) and leading technology companies. The WBA member operators collectively serve more than 1 billion subscribers and operate more than 10 million hotspots globally. The WBA Board includes AT&T, Boingo Wireless, BT, Cisco Systems, Comcast, Intel, Liberty Global, KT Corporation, NTT DOCOMO, Orange and Ruckus. For a complete list of the current WBA members, please see <https://www.wballiance.com/join-us/current-members/>.

These comments were prepared by the following participating WBA member companies; Accuris Networks, Alphabet Access, Broadcom, Cisco, Hewlett Packard Enterprise, Intel Corporation and Ruckus. These comments do not necessarily represent the view of any member of the Wireless Broadband Alliance not previously named or the view of any of the Alliance's Board of Directors not affiliated with those previously named entities. All further references to "the WBA" are attributable to the participating companies.

The WBA is encouraged by the Commission's inquiry into opportunities for additional flexible access to mid-band spectrum. We represent members who have interests in licensed, unlicensed (i.e. license exempt), and coordinated shared (e.g. CBRS and LSA) spectrum. The WBA supports policies and regulations whereby adequate spectrum is designated under each of these management regimes. We also believe that when considering allocations and designations, policymakers and regulators need to account for the specific capabilities and limitations of low-band, mid-band, and high-band spectrum, and ensure that sufficient spectrum is allocated to each regime for each of these frequency ranges.

As the Commission begins this consideration of additional mid-band unlicensed designations, the WBA believes that the following characteristics should be included:

- **Frequency Characteristics**, such as free space propagation and the ability to penetrate typical structural materials (both exterior and interior);
- **Contiguous Designations**, the need for large contiguous portions of spectrum which can be divided into operating channels with the wider bandwidths (e.g. 80 and 160 MHz) to support Gigabit and Multi-Gigabit services;
- **Proximity to Existing Designations**, industry will be able to commercialize new designations more rapidly if they are located near existing designations, and may be able to aggregate channels across the existing and new frequency ranges;
- **Support for Existing Operational Parameters**, it would be highly desirable to align the technical operating parameters as much as possible with the

parameters that apply to the existing mid-band unlicensed designations. This will also allow industry to move quickly to bring products to market.

In Section II of the comment below, the WBA discusses its members' pressing need for additional mid-band unlicensed spectrum, and in Section III, the good use that industry is already making of channels in the 5 GHz band that require Dynamic Frequency Selection. In Section IV, the WBA urges the Commission to promptly move this proceeding to a Notice of Proposed Rulemaking phase, and asks that the entire 5.925-7.125 GHz band be considered for unlicensed. In the WBA's view, unlicensed use best ensures that incumbents can continue to exercise their spectrum rights. At the same time, a broad swath of spectrum is needed to support multiple wide channel operations, to reduce power spectral density of unlicensed use, and to ensure commercially reasonable spectrum availability for unlicensed technologies. Alternatives to unlicensed are less attractive. The WBA asks the Commission to consider adopting policy principles to assist in its decision-making. In addition, the WBA argues that from what is known about existing licenses in the band, there is good ground to examine if under-utilized spectrum can be put to work, and suggests four new U-NII designations that map to incumbent use. The WBA also suggests a series of questions the NPRM should include on mitigations. Section V comments on 3.7-4.2 GHz, and Section VI notes the larger examination of mid-band spectrum up to 24 GHz, encouraging the Commission to place its immediate focus on 6 GHz for unlicensed.

II. THE PRESSING NEED FOR ADDITIONAL MID-BAND UNLICENSED SPECTRUM

A Quotient Associates report was issued in February that modeled the amount of traffic that will need to be carried by Wi-Fi in the years 2020 and 2025, and the amount of unlicensed spectrum that would be required¹. For the United States, the report forecasts a gap of from 220 to 628 megahertz of unlicensed spectrum by 2020, and a gap of from 540 to 1588 megahertz of unlicensed spectrum by 2025. The report also points out that while millimeter wave spectrum can certainly be utilized for many valuable applications, it does not meet the needs fulfilled by mid-band spectrum, such as multi-room coverage in a home, coverage for an office building, outdoor Wi-Fi hotspots, and other use cases.

Similarly, Qualcomm recommended in its latest report² on unlicensed spectrum needs that:

- To enable future WLAN-type application and usage scenarios, regulators should plan for around 1280 MHz of unlicensed spectrum centered around the 5 GHz band for use by unlicensed technologies.
- Higher throughput coverage scenarios in dense environments require extensive use of 160 MHz channel bandwidth modes; regulators should strive towards making multiple (i.e., 3 or more) 160 MHz wide channels available for unlicensed use.

¹ Quotient Associates, *Wi-Fi Spectrum Needs Study*, <https://www.wi-fi.org/file/wi-fi-spectrum-needs-study>

² Qualcomm, *A Quantification of 5 GHz Unlicensed Band Spectrum Needs* <https://www.qualcomm.com/media/documents/files/a-quantification-of-5-ghz-unlicensed-band-spectrum-needs.pdf>

Findings and projections from Cisco's latest Visual Networking Index (VNI)³ further demonstrate the need for additional mid-band unlicensed spectrum, reporting that:

- In the United States, Wi-Fi IP traffic will reach 34.0 Exabytes per month in 2021, up from 10.9 Exabytes per month in 2016.
- The United States's Wi-Fi IP traffic grew 32% in 2016.
- In the United States, Wi-Fi IP traffic will grow 3-fold from 2016 to 2021, a compound annual growth rate of 26%.

All of these reports indicate a profound and growing need for additional designations of mid-band spectrum for unlicensed operations. Unfortunately, the reality is that there have been no new designations of mid-band unlicensed spectrum since 2002. There was great hope for use of the 5350-5470 MHz band, but last year that opportunity was taken off the table.

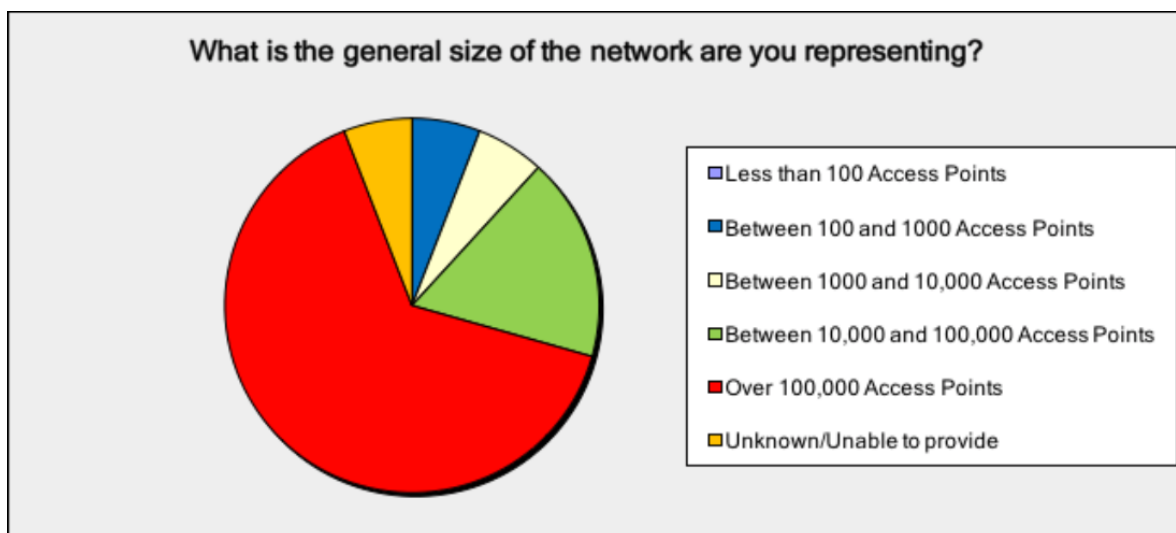
In a survey conducted in June 2017, the WBA members overwhelmingly indicated that additional mid-band unlicensed spectrum will be needed in the near future to support their operations. Specifically, 96% of respondents agreed that, "Obtaining additional mid-band spectrum (i.e. spectrum between 1 GHz and 10 GHz) for unlicensed (license exempt) operations is vital to the WBA Members, and as long as incumbents are adequately protected, the WBA should play an active role in supporting unlicensed operations in the 6GHz band". The majority of these responses were from fixed or mobile network operators.

³ Cisco, *VNI Global Fixed and Mobile Internet Traffic Forecasts*
<https://www.cisco.com/c/en/us/solutions/service-provider/visual-networking-index-vni/index.html>

We are therefore pleased to offer the following comments with regards to unlicensed operation in the 5.925 to 7.125 GHz range.

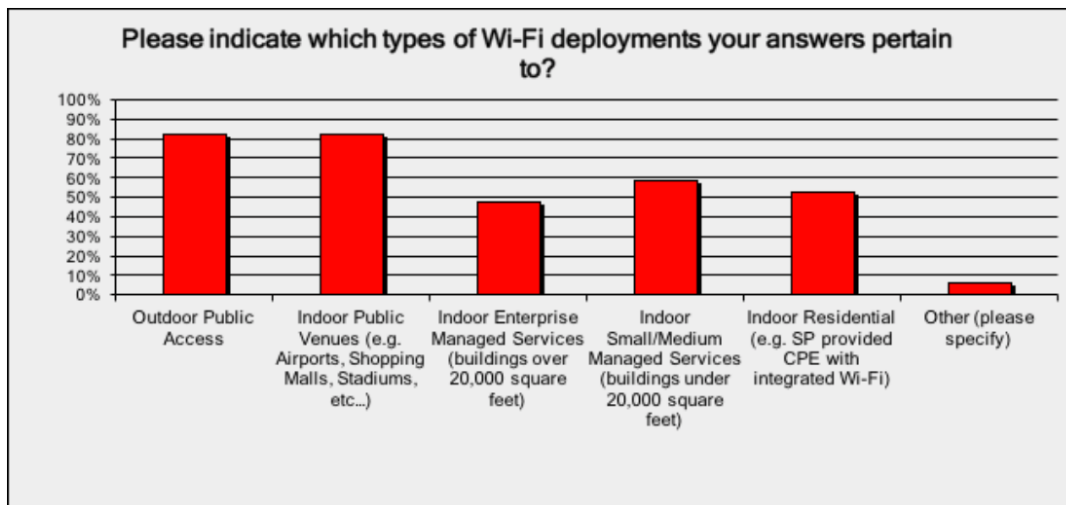
III. COMMENTS ON DYNAMIC FREQUENCY SELECTION (DFS) IN THE 5 GHZ BANDS

Earlier this year, the WBA conducted a survey of our members regarding the utilization of DFS in their networks. We received responses from a representative sample of the Alliance, with over 70% of the respondents representing the mobile network operator (MNO), multiple system operation (MSO), or Wi-Fi service provider sectors. As might be expected of networks operated by these types of entities, 64% of the respondents are responsible for networks of more than 100,000 Access Points, and another 18% of the respondents are responsible for networks of between 10,000 and 100,000 Access Points.



The responses reflect a variety of deployment types, with strong representation of both Outdoor and Indoor Public Access Wi-Fi, significant representation of Small/Medium Business Managed Service Wi-Fi, and slightly lower representation of Enterprise Managed Service and

Residential Wi-Fi. The mix of deployment types represented in the responses is shown in the following graphic.



For the Outdoor and Indoor Public Access Wi-Fi, and the Enterprise Managed Service Wi-Fi, 100% of respondents indicated that their network equipment supported DFS and that they have enabled the use of channels requiring DFS. For Small/Medium Business Managed Service Wi-Fi and Residential Wi-Fi, 92% of respondents indicated that their network equipment supported DFS, and nearly the same percentage of respondents indicated that they have enabled the use of channels requiring DFS. These survey responses show that the WBA members are making extensive use of the Wi-Fi channels that are subject to DFS requirements.

We received less uniform responses when we asked whether our members felt that the channels requiring DFS were less utilized than non-DFS channels, and there was more variance in responses to this question amongst the deployment types as well. Almost 80% of responses that represented Outdoor Public Access Wi-Fi believed DFS channels were less utilized. This number dropped to 60% for both Indoor Public Venues and Indoor Enterprise Managed Service Wi-Fi. It fell further to 50% for Indoor Small/Medium Business Managed Service Wi-Fi, and still

further to 42% for Residential Wi-Fi. There was no clear consensus amongst the responses for the reasons that the DFS channels were not believed to be as heavily utilized as non-DFS channels, with respondents noting issues with client support, excessive/erroneous triggering of DFS events, certification/compliance for DFS, and other reasons. A number of the comments that were received in the responses indicated that newer generations of Wi-Fi chipsets and devices are more capable of identifying incumbent activity while avoiding false detections.

Overall, the survey responses show that the WBA members are making good use of the 5 GHz U-NII bands that are subject to DFS requirements, that utilization of Wi-Fi channels operating in these DFS bands is likely lower than in non-DFS bands in 5 GHz, and that the ability to utilize DFS spectrum has improved with recent generations of Wi-Fi products. While additional efforts could be undertaken to further optimize the use of DFS bands in 5 GHz, the WBA believes that our survey reflects that industry is indeed making good use of this DFS spectrum while protecting incumbent operations.

IV. COMMENTS ON 5.925 TO 7.125 GHZ

The NOI distinguishes between the 5.925-6.425 GHz band and the 6.425-7.125 GHz band. For 5.925-6.425 GHz, the NOI invited comment on unlicensed use, given its proximity to unlicensed spectrum in the 5 GHz range that is increasingly used by U-NII devices.⁴ With respect to 6.425-7.125 GHz, the NOI invited comment on its use by U-NII or other unlicensed devices, fixed services, or terrestrial mobile.⁵ As will be discussed below, the WBA believes

⁴ NOI at para. 26.

⁵ NOI at para. 36.

both 5.925-6.425 GHz and 6.425-7.125 GHz should be considered for unlicensed use, and that the two bands should be merged for comment at the Notice of Proposed Rulemaking stage.

In this section, the WBA explains its view that 5.925-7.125 GHz is a better candidate for unlicensed use, and that alternatives such as adding primary rights holders, designating existing licenses with flexible rights, or creating secondary rights holders, is less attractive as a policy choice. The WBA also proposes several policy principles that it suggests the FCC consider that could be helpful in later considerations of technical rules. The WBA states its view that there appears to be good ground to examine under-utilized spectrum in this band, and offers its suggestion for consideration of four additional U-NII bands. Finally, the WBA provides a list of questions the Commission should consider in the NPRM on mitigations.

A. Incumbent use of the band is extensive and better lends itself to unlicensed use; unlicensed needs access to a broad swath of spectrum to make meaningful use of the band

In the WBA's view, unlicensed use of the entire 5.925-7.125 GHz is the most effective way to unlock the additional value of the band. As noted in the NOI, unlicensed use does not confer spectrum rights – unlicensed must not cause interference and must accept interference.⁶

Putting under-utilized spectrum to work by unlicensed devices therefore does not diminish spectrum rights held by incumbents. Incumbents can continue operating as before. They can deploy new systems, re-tune existing systems to different frequencies and fully exercise their spectrum rights as defined by the FCC. In sum, the WBA sees no reason to depart from the

⁶ 47 CFR §15.5.

existing paradigm for unlicensed use in the 5 GHz band. Moreover, unlicensed has a strong track record of sharing spectrum with many different types of incumbents.

The requirement that unlicensed defer to licensed incumbents is important due to the significant number of incumbent licenses in the band. These include (but are not limited to) C-band uplink facilities, various point to point systems utilizing microwave technologies (including links operated by, or on behalf of, public safety communications networks); television broadcast auxiliary systems, including mobile systems, and cable television relay service stations. Not only are there a considerable number of licenses, the variety of systems in the band presents challenges for utilizing spectrum in a way that will not impede incumbent operations.

Therefore, the WBA believes that as these proceedings move forward, the Commission should consider a broad swath of spectrum for unlicensed use, namely 5.925 -7.125 GHz. Given the requirement to protect incumbents, this broad designation of spectrum is necessary to support commercially reasonable spectrum availability for the unlicensed technologies that are most likely to use the band.⁷ As will be discussed below, a broad swath of spectrum enables multiple wide channels to be utilized in a system, and lowers the overall power spectral density presented by the presence of unlicensed transmitters.

The number of licensees in the band has other important implications. With nearly 100,000 licensed links listed in the ULS band alone,⁸ the WBA does not recommend that the Commission

⁷ The spectrum from 5925-7125 MHz is already identified for Part 15 Ultra-Wideband and Level Probing Radar uses, but at very low power levels. These rules do not support the goal of extending 5 GHz Radio Local Access Network (RLAN) equipment into the 6 GHz band.

⁸ This is an estimate from the ULS and does include CARS or CARS links.

undertake an exercise to move these incumbents to another band – a process that would be contentious, expensive, uncertain and lengthy, in addition to being unnecessary in the opinion of the WBA. The better course would be to preserve incumbent operations, while creating complementary opportunities for unlicensed devices to utilize band resources in a way that does not create harmful interference to incumbents.

B. Alternatives to an unlicensed regime are less attractive

Alternatives to unlicensed are less desirable than introducing an unlicensed regime. Given that the WBA does not recommend band clearing, alternatives include:

- Assignment of primary rights to licensees for underutilized spectrum. This alternative would diminish the rights of current spectrum holders in the band, and is less desirable than the unlicensed alternative.
- Converting existing licenses to flexible licensing, enabling existing licensees to migrate to terrestrial broadband uses. Given that the largest number of licenses are point to point, a flexible licensing approach is unlikely to provide a consistent and reasonable footprint for licensed terrestrial cellular services.
- Creating a new category of secondary spectrum rights holders for terrestrial cellular services use in underutilized spectrum. While use of the band by a secondary rights holder might be possible, secondary rights significantly raise operational complexity for mobile networks. Indeed, this has been a key issue in the 3.5 GHz proceeding, which has been resolved for that band due only to the infrequency of naval radar operation along the US coasts and the relatively low number of other incumbents –

i.e., terrestrial cellular services have reasonable confidence of access to spectrum without preemption except in a very few specific geographic areas for relatively short durations at infrequent intervals. In the bands at issue in this proceeding, incumbent uses are far more intensive and extensive, and therefore it would be challenging to provide any assurance of access for secondary rights holders.

C. Proposed rules and final decisions should be considered within a framework of policy principles

The NOI contains many questions, most of them technically oriented. There will be a number of choices that the Commission will need to make. Creating a policy framework can inform decision-making on difficult technical questions. With respect to adding unlicensed use, an on-the-record discussion of, and agreement around, principles will at a minimum inform the debate. The WBA believes the following to be true, and recommends the Commission adopt a set of principles such as these in the Notice.

First, the purpose of introducing unlicensed devices into the band is to achieve higher utilization of the band, to satisfy the exploding demand for unlicensed spectrum, and thereby to foster economic growth by enabling devices to utilize spectrum that is not today fully utilized by incumbents. The exploding use cases supported by unlicensed devices today – including broadband delivery, M2M and IoT -- are a harbinger of what's to come as we continue to move toward the next generation of technology.

Second, the state of unlicensed technology should be a key factor in the Commission's decision: by making available multiple large bandwidth channels, unlicensed access to 5.925-7.125 GHz will enable the next generation of devices to participate in the larger 5G ecosystem.⁹ This mid-band spectrum is ideally suited for a variety of use cases, including those requiring high speed connectivity and dense deployments. Moreover, unlicensed systems require multiple channels to perform well in environments where other unlicensed transmitters are present. Ideally, spectrum should be available for no less than five additional 160 MHz channels.

Spreading unlicensed use throughout the 5.925-7.125 GHz band enables unlicensed devices to maintain a lower overall power spectral density than if devices were limited to 5.925-6.425 GHz, which will greatly enhance the sharing environment. In addition, unlicensed technologies are cognitive. They can adapt to the band environment by changing frequencies to further reduce the risk of interference and achieve higher overall spectrum utilization. Indeed, the Commission's formulation of Dynamic Frequency Selection in the 5 GHz band is an example of this.

Third, the purpose of mitigation is to protect incumbents. It does not exist to burden unlicensed devices with unneeded requirements for band utilization. The solution set that provides the least amount of burden, but that also protects incumbents, is the best resolution. As a corollary, mitigations must address the specifics of the incumbent systems in a given band,

⁹ Wireless Broadband Alliance, *5G Networks – The Role of Wi-Fi and Unlicensed Technologies*, <https://www.wballiance.com/resources/wba-white-papers/#>

and in designing mitigations, those that are both simple and effective in protecting licensed interests would be more desirable.

Fourth, unlicensed devices in the 6 GHz band are not “greenfield” in that they are natural extensions of the well-established 5 GHz unlicensed ecosystem. The resolution of operational and mitigation requirements should strive where possible to ensure that the user experience at 6 GHz is not noticeably different than at 5 GHz.

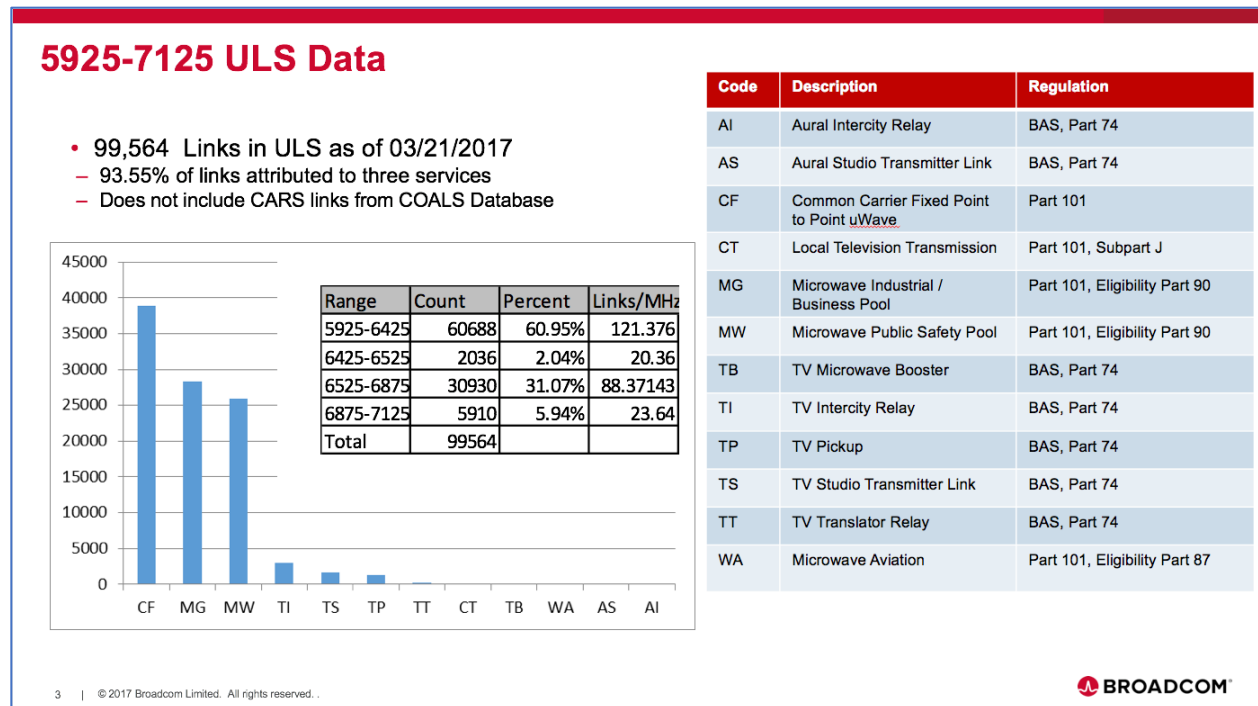
Finally, Commission action should be timely. Prompt action is needed to ensure U.S. leadership internationally, and to support ongoing industry standards setting work. By setting the rules first, the Commission can lay down a marker for other nations to follow, and influence industry standards-setting processes that are now ongoing.¹⁰

D. The WBA believes that there is spectrum availability sufficient to support unlicensed uses, once interference analysis is complete

The threshold issue for the unlicensed community in considering whether to enter a band ‘is whether there would be a reasonable amount of spectrum available nationally to support current and planned technology’. An initial look at the band reveals that there appears to be sufficient conditions to warrant Commission examination of the band for unlicensed use. As a first step, looking at the number of licenses can give an early indication of the potential for sharing. While the band is used by incumbents, a review of the ULS indicates that there is a

¹⁰ See 11ax 6 GHz PAR mod 913r2 to EC agenda for Nov meeting. Working Group motion to add 6 GHz passes available at: <https://mentor.ieee.org/802.11/dcn/17/11-17-1035-02-0000-minutes-working-group-july-2017.doc> at page 14. The proposed modification to the PAR will be considered at the Executive Committee in November 2017.

wide range in terms of the intensity of use within the band. For example, the chart on the following page is an example of ULS licensees by an estimated link count.



Per this ULS analysis, it appears that different parts of the band are used with different levels of intensity by terrestrial licensees. Of course, this is not an interference analysis, and does not answer the question of how much spectrum might be available, much less the mitigations that would be required. Nor does it tell us the intensity of activity in urban versus rural areas, although anecdotally it appears there are more licenses in urban areas. But it does provide a starting point for thinking about the band as a candidate for unlicensed use.

For satellite uplink, there also appears to be a variation in how incumbents are using portions of the band:

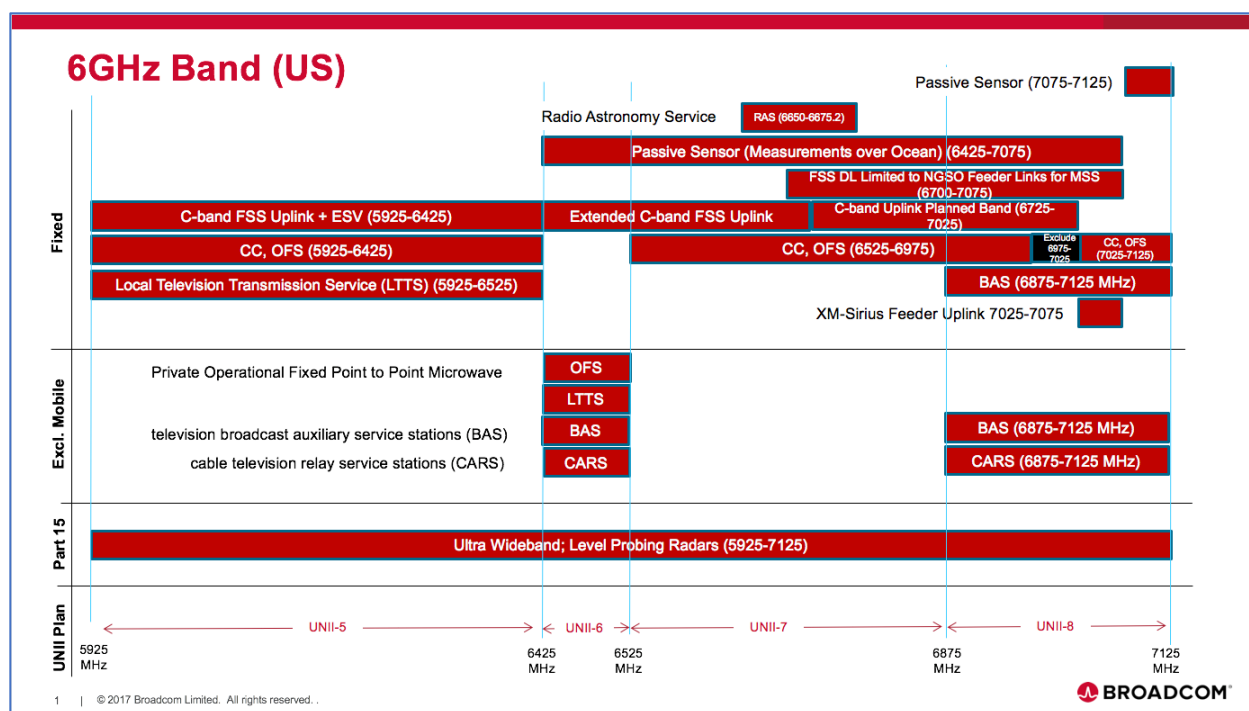
Band	Part 25
5925-6425 MHz	7,534
6425-6525 MHz	312
6525-6700 MHz	87
Total	7,933

Again, this type of data is just a starting point in the analysis, but it does suggest that there is opportunity worth exploring. Future sharing would look to unoccupied frequencies by geography. The greatest number of licenses appear to be in the lower part of the band. While further analysis is ongoing, a working hypothesis is that these are probably clustered in and around urban areas. It therefore appears important to have broad access to spectrum – from 5.925-7.125 GHz -- so that there will be robust access to spectrum nationally.

In addition, the WBA believes that the current use pattern and predicted growth is not likely to achieve maximum utilization of the spectrum given the current state of the art wireless technologies. Significant portions of the spectrum are likely to remain underutilized. To what extent must be examined in an engineering analysis.

E. The WBA believes that unlicensed use can be mapped to the existing conditions in the band

As was the case in 5 GHz, the existing incumbencies in the 6 GHz band suggest natural breakpoints. For example, the IEEE has begun investigating the addition of four U-NII designations in the 6 GHz band, as indicated on the following chart. While this is an IEEE example, the U-NIIs as designed by the Commission would of course be open to use by any unlicensed technology meeting the mitigation requirements.



In the WBA’s view, this approach would enable unlicensed technologies to utilize broad channelization based on the availability of contiguous spectrum. As the Commission is well aware, contiguous spectrum is important to support the availability of multiple channels. As the U-NIIs would map to existing incumbents, this approach also permits discussion of mitigations tailored to the characteristics of incumbent systems.

F. No “one size fits all” for mitigation techniques

Given the variety of incumbencies noted above, there is unlikely to be a “one size fits all” approach that can address protection requirements as incumbent systems differ substantially.

The WBA suggests the Commission first determine mitigations needed to protect the major categories of users in the band (FSS, FS, broadcast) and then look at whether that solution set can also adequately protect other services or uses of the band. The WBA further

suggests that the Commission be open to imposing different requirements on indoor versus outdoor unlicensed devices if necessary. Indoor devices tend to operate at lower power levels, and emissions are attenuated by roofing materials, as well as interior and exterior walls. As noted in the decision to adjust rules for U-NII-1 transmitters:

These types of consumer-oriented devices should not contribute to interference concerns, as the building materials used in indoor environments should sufficiently attenuate energy transmitted from indoor devices to prevent any significant contribution to any noise rise seen by Globalstar's satellite.¹¹

In that decision, more extensive mitigations were imposed on outdoor devices, namely an elevation mask to prevent emissions from being seen by satellites in operation in the band.

The WBA therefore suggests that the Notice request comment on the following approaches:

- An elevation mask similar to the U-NII-1 rules to protect satellite operations that would apply to outdoor transmissions
- Differentiated power levels, including tradeoffs between power levels and more extensive mitigation technology. The Notice should ask questions about whether indoor and outdoor uses should be differentiated in this respect, and whether 6 GHz could support the power levels utilized in 5 GHz.

¹¹ Revision of the Commission's Part 15 Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band, ET Docket No. 13-49, First Report and Order, April 1, 2014 at para. 44.

- Databases such as those developed for use in other bands. Various types of databases exist. The WBA notes that databases would represent a sharp departure from the existing unlicensed 5 GHz ecosystem where mitigation is addressed using simpler techniques. Database-orchestrated mitigation would therefore introduce additional cost and complexity. The WBA believes this option should be considered only if simpler options do not protect incumbents from harmful interference.

The WBA has no objections to various mitigations being considered in the Notice, but urges the FCC to focus on a core group of mitigations proposed in the NOI comment process, such as the list above, to begin to limit debate.

V. COMMENTS ON 3.7 TO 4.2 GHZ

While many of the WBA members are following this portion of the proceeding closely and will likely be offering their own comments, the WBA does not have any specific comments on additional flexible access in 3.7 to 4.2 GHz. We do note the tight incumbent linkage between the 3.7 to 4.2 GHz band and the 5.925 to 6.425 GHz band, in that they support the downlink (space to earth) and uplink (earth to space) services respectively for C-Band satellite services. We commend the Commission for its decision to evaluate both of these bands in parallel.

VI. COMMENTS ON OTHER BANDS BETWEEN 3.7 AND 24 GHZ

The WBA is encouraged that the Commission is exploring all the bands between 3.5 GHz and 24 GHz for additional broadband use. The WBA believes it is vital to have a pipeline of licensed, unlicensed, and coordinated shared spectrum in the queue. However, the WBA notes

that the 5.925 to 7.125 GHz band is best suited for near term unlicensed operations for the reasons specified above, and encourages the Commission to make haste in designating this for unlicensed broadband operations.

VII. CONCLUSION

There is an urgent need for action to make additional mid-band spectrum available for unlicensed uses. The WBA is encouraged by the Commission's issuance of this Notice of Inquiry and urges prompt action towards a Notice of Proposed Rulemaking. We believe that unlicensed operation in the 5.925 to 7.125 GHz range, while protecting incumbent services, is possible based on early industry analysis of the existing uses and unlicensed technology's record of coexisting on a non-interference basis. As the Commission begins this process, we recommend it adopt a set of principles to help guide its deliberations.

Respectfully,

A handwritten signature in black ink, appearing to read 'Tiago Rodrigues', is placed over a light gray rectangular background.

Tiago Rodrigues

Senior Director

Corrected on October 10, 2017